BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: AMMONIA

1. Chemical Product and Company Identification

BOC Gases,
Division of,
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER: CHEMTREC (800) 424-9300

BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER: (905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101

PRODUCT NAME: AMMONIA
CHEMICAL NAME: Ammonia
COMMON NAMES/SYNONYMS: Ammonia Anhydrous; Anhydrous Ammonia
TDG CLASSIFICATION: 2.3, 8
WHMIS CLASSIFICATION: A, E

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/1/99

2. Composition, Information on Ingredients

EXPOSURE LIMITS[1]:

INGREDIENT	% VOLUME	PEL-OSHA[2]	TLV-ACGIH[3]	LD_{50} or LC_{50} Route/Species
Ammonia FORMULA: NH_3 CAS: 7664-41-7 RTECS #: BO0875000	100.0	50 ppm TWA	25 ppm TWA 35 ppm STEL	LC50: 7338 ppm inhalation/rat (1 H)

[1] Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.
[2] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
[3] As stated in the ACGIH 1998-1999 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.
IDLH: 300 ppm

3. Hazards Identification

EMERGENCY OVERVIEW

Colorless gas with strong irritating odor. Corrosive gas. Can cause severe irritation and burns to exposed tissue including eyes and skin. Inhalation may damage the lungs, causing swelling and fluid retention (edema) and chemical pneumonitis. Slightly flammable. Contents under pressure. Use and store below 125 ^{o}F.

ROUTE OF ENTRY:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	No	Yes	Yes	No

HEALTH EFFECTS:

Exposure Limits	Irritant	Sensitization
Yes	Yes	No
Teratogen	Reproductive Hazard	Mutagen
No	No	Yes
Synergistic Effects None Reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:
Mild concentrations of product will cause conjunctivitis. Contact with higher concentrations of product will cause swelling, painful burns, lesions and possible loss of vision.

SKIN EFFECTS:
Mild concentrations of product will cause dermatitis. Contact with higher concentrations of product will cause caustic-like dermal burns and inflammation. Toxic level exposure may cause skin lesions resulting in early necrosis and scarring.

INGESTION EFFECTS:
Since product is a gas at room temperature, ingestion is unlikely.

INHALATION EFFECTS:
Corrosive and irritating to the upper respiratory system and all mucous type tissue. Depending on the concentration inhaled, it may cause burning sensations, coughing, wheezing, shortness of breath, headache, nausea, with eventual collapse and death.

Inhalation of excessive amounts affects the upper airway (larynx and bronchi) by causing caustic-like burning resulting in edema and chemical pneumonitis. If it enters the deep lung, pulmonary edema will result. Pulmonary edema and chemical pneumonitis are potentially fatal conditions.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May aggravate pre-existing, eye, skin, and respiratory disorders.

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 3	Health: 3	0 = No Hazard
Flammability: 1	Flammability: 1	1 = Slight Hazard
Instability: 0	Reactivity: 0	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

4. First Aid Measures

EYES:
Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. PERSONS WITH POTENTIAL EXPOSURE TO AMMONIA SHOULD NOT WEAR CONTACT LENSES. Seek immediate medical attention.

SKIN:
Remove contaminated clothing as rapidly as possible. Flush affected area with copious quantities of water. If irritation persists or skin appears damaged, seek immediate medical attention.

INGESTION:
Not specified. Seek immediate medical attention.

INHALATION
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Keep victim warm and quiet. Assure that mucus or vomited material does not obstruct the airway by positional drainage.

5. Fire Fighting Measures

Conditions of Flammability: Nonflammable		
Flash point: None	Method: Not Applicable	Autoignition: Temperature: 1274 ^{o}F (690 ^{o}C)
LEL(%): 16	UEL(%): 25	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:
The minimum ignition energy for ammonia is very high. It is approximately 500 times greater than the energy required for igniting hydrocarbons and 1000 to 10,000 times greater than that required for hydrogen; however, low concentrations are required for ignition. Release in a confined space may present an explosion hazard. Cylinders may rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:
Water fog. Use media suitable for surrounding fire.

FIRE FIGHTING INSTRUCTIONS:
If possible, stop the flow of gas. Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear with butyl rubber clothing as necessary to prevent exposure. Since ammonia is soluble in water, it is the best extinguishing medium -- Water will extinguish the fire and also absorb the escaped ammonia gas. Use water spray to cool surrounding containers. Prevent entry of corrosive run-off waters into waterways and sewers. Continue to cool fire-exposed containers until well after flames have been extinguished.

6. Accidental Release Measures

Immediately evacuate all personnel from affected area. Deny entry to unauthorized and unprotected individuals. Use appropriate protective equipment including skin and eye protection. Extinguish ignition sources. Consult a HAZMAT specialist and the appropriate emergency telephone number in Section 1 or your closest BOC location. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

7. Handling and Storage

Electrical Classification:
Class 1, Group D.

Earth-ground and bond all lines and equipment associated with the ammonia system. Electrical equipment should be non-sparking or explosion proof.

Gaseous or liquid anhydrous ammonia corrodes certain metals at ambient temperatures. The presence of oxygen enhances the corrosion of ordinary or semi-alloy steels. The addition of water inhibits this enhancement. Keep anhydrous ammonia systems scrupulously dry.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure regulator when connecting cylinder to lower pressure (<500 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve to trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125 ^{o}F (52 ^{o}C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Post “NO SMOKING” signs in storage and use area. There should be no sources of accidental ignition in use and storage area.

For additional handling recommendations, consult Compressed Gas Association Pamphlets P-1, G-2, G-2.1, G-2.2, and P-26.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:
Use local exhaust ventilation to reduce concentrations to within current exposure limits. A laboratory type hood is suitable for handling small or limited quantities.

EYE/FACE PROTECTION:
Gas tight chemical goggles or full-face piece respirator.

SKIN PROTECTION:
Protective gloves, boots, or fully encapsulated vapor protective clothing of butyl rubber as necessary to prevent exposure.

RESPIRATORY PROTECTION:
Positive pressure air line with full facepiece and escape bottle or SCBA should be available for emergency use.

OTHER/GENERAL PROTECTION:
Safety shoes, safety shower, eyewash "fountain".

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 70°F	: 94	psia
Vapor density at 60°F (Air = 1)	: 0.62	
Evaporation point	: Not Available	
Boiling point	: -28	°F
	: -33.3	°C
Freezing point	: 107.9	°F
	: -77.7	°C
PH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H_20)	: Very soluble	
Odor threshold	: Not Available	
Odor and appearance	: A colorless gas with a pungent odor.	

10. Stability and Reactivity

STABILITY:
Stable.

CONDITIONS TO AVOID (STABILITY):
Avoid water.

INCOMPATIBLE MATERIALS:
Reacts with acids and oxidizing materials (fluorine, chlorine, etc.) Corrosive to copper, zinc, and many metal surfaces. Reacts with hypochlorite or other halogen sources to form explosive compounds which are pressure and temperature sensitive.

HAZARDOUS DECOMPOSITION PRODUCTS:
Hydrogen at very high temperatures: 1544°F (840°C).

CONDITIONS TO AVOID (POLYMERIZATION):
None

HAZARDOUS POLYMERIZATION:
Will not occur.

11. Toxicological Information

INHALATION:
Ammonia can cause severe irritation and damage to the lungs and respiratory tract. The acute LC_{50} (1 hour, rat) for ammonia is 7338 ppm. High level exposures may result in immediate and/or long-term respiratory problems. Symptoms may be delayed following exposure.

SKIN AND EYE: Contact with skin and eyes may cause burns and blisters or eye damage and partial or complete blindness**.**

MUTAGENIC:
Genetic mutations observed in bacterial and mammalian test systems.

OTHER:
Toxic effects to the respiratory system, senses, liver, kidneys and bladder observed in mammalian species from prolonged inhalation exposures at above 100 ppm.

12. Ecological Information

OTHER ENVIRONMENTAL INFORMATION:
The reportable quantity is the minimum quantity of a material that when released, requires reporting to the appropriate Federal, State and local officials. Notification requirements are found under CERCLA Section 103(a). Initial notification may be by telephone, radio, or in person. A written follow-up notice is also required.

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	CANADA TDG*
PROPER SHIPPING NAME:	Ammonia, Anhydrous	Ammonia, Anhydrous
HAZARD CLASS:	2.2	2.3(8)
IDENTIFICATION NUMBER:	UN 1005	UN 1005
SHIPPING LABEL:	NONFLAMMABLE GAS	TOXIC GAS, CORROSIVE

*Described in accordance with the UN Recommendations on the Transport of Dangerous Goods, 10th Edition.
Additional Marking Requirement: "Inhalation Hazard"
If net weight of product ≥ 100 pounds, the container must be also marked with the letters "RQ".
Packaging Requirement: 173.304

15. Regulatory Information

Ammonia is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

SARA TITLE III NOTIFICATIONS AND INFORMATION
Ammonia is listed as an extremely hazardous substance (EHS) subject to state and local reporting under Section 304 of SARA Title III (EPCRA) with a reportable quantity (RQ) of 100 pounds.

The presence of Ammonia in quantities in excess of the threshold planning quantity (TPQ) of 500 pounds requires certain emergency planning activities to be conducted.

SARA TITLE III - HAZARD CLASSES:
Acute Health Hazard
Sudden Release of Pressure Hazard
Reactivity Hazard

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:
This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

CAS NUMBER	INGREDIENT NAME	PERCENT BY VOLUME
7664-41-7	AMMONIA	100.0

This information must be included on all MSDS that are copied and distributed for this material.

16. Other Information

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
WHMIS	Workplace Hazardous Materials Information System

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

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